Re-Alignment of Responsibility for the Management of the State's IT Resources and Infrastructure

By

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This report addresses the important question of how California should allocate or re-align responsibilities for the State's basic information technology infrastructure including, most particularly, management responsibility for mainframe and server-based systems. In addition to providing a general framework for analyzing this broad issue, the report addresses two specific instances of re-alignment: (1) the consolidation of the Health and Human Services Data Center and the Stephen P. Teale Data Center; and (2) aggregation of servers and related technologies within data centers.

Responsibility for IT Infrastructure

The State has concentrated most of its mainframe systems in several general-purpose data centers (i.e., the Health and Human Services Data Center and the Stephen P. Teale Data Center), while we have dispersed responsibility over servers and desktop functions to individual departments.

In order to achieve the most cost-effective procurement, operation, management and utilization of these resources – i.e., to achieve the appropriate levels of quality, cost, and risk management from an enterprise-wide perspective – the State should align management responsibility for IT resources and services with departmental core competencies and business needs.

As a general matter, computing technologies that are unique to an individual department's business needs should be managed by that department (assuming it has the capacity to manage the technology and there are not countervailing special considerations that would warrant management by a general purpose data center). Similarly, computing services that are widely

used throughout government and which may be physically consolidated (e.g., e-mail services) should generally not be managed by individual departments, but should be centrally managed by a data center in order to secure consistent quality, economies of scale, appropriate risk management and security.

Data Center Consolidation

As noted above, the State has two general-purpose data centers, which serve large numbers of Executive Branch departments. The Legislative Analyst has recommended that these two data centers be administratively consolidated (i.e., a merger of their executive, administrative, accounting and/or HR functions). Although an analysis by the Department of Finance indicates that no immediate operational savings will be derived, and that even administrative savings will take a period of time to plan and implement, there are significant strategic benefits to the State from an "executive consolidation" (i.e., placing both data centers under a single executive officer in a Statewide Consolidated Data Center), including:

- Creating a Consolidated Data Center which can comprehensively examine the potential cost-savings and economies of scale from further administrative or operational consolidation;

- Creating a single, strong voice on technology issues in the IT leadership for the State (i.e., a "Chief Technology Officer"); and,

- Even without administrative or operational consolidation, creating an opportunity for significant savings in leveraged IT procurements on behalf of the entire State.

To resolve details associated with creating a Statewide Consolidated Data Center, the State CIO will appoint a team of high level IT executives within the State to prepare a Statewide Consolidated Data Center Reorganization Proposal pursuant to which a consolidation would occur as of July 1, 2004.

Server Aggregation

"Server aggregation" describes a process of consolidation where large numbers of servers that are presently operated and located in departments

are physically moved to a data center, and operational responsibility for those servers is transferred from the department to the data center. Server aggregation, if done at a large enough scale, results in significant cost-savings while improving the overall management, operation and security of the State's server infrastructures. To achieve the desired economies of scale, data centers and departments should work with the Department of Finance to determine the types of servers that are most appropriate for aggregation and how aggregation affects departmental and data center budgets and staffing.

Maintaining a server is a separate function from operating and maintaining the applications that run on a server. Responsibility for server maintenance can be lodged in a data center while responsibility for operating and maintaining the applications that run on the server can be lodged in a program department. This is, in fact, a fairly typical division of responsibility between a data center and a customer (e.g., the data center maintains the mainframes, but program departments maintain and operate the programs that run on the mainframes).

Over the last year, the Health and Human Services Data Center has begun offering its customers centralized management of messaging services (i.e., e-mail). This service offering involves the aggregation of messaging servers into the data center and the transfer of responsibility for managing the messaging applications from departments to the data center. The economies of scale from an expansion of this service offering are substantial. The State should immediately pursue aggregation of messaging servers and messaging applications into HHSDC to the maximum extent possible. As the data center gains experience with this effort, we should begin examining whether there are other enterprise-wide applications that would benefit from a similar form of centralized management.

Another form of server aggregation is "co-location." Co-location is a voluntary data center service offering where a data center customer maintains ownership and primary operational responsibility for certain computing resources (e.g., a set of servers and associated software applications which run on those servers) but those resources are physically housed in a data center. This type of service takes advantage of a data center's physical infrastructure (e.g., floor space, air-conditioning, power supply and backup, network support and physical security) while recognizing that department-specific technologies may be most effectively managed by the department itself.

Co-location is a mixed form of consolidation (i.e., physical consolidation but not operational consolidation), and it naturally raises the question in particular cases of whether co-location should be viewed as a transition to full consolidation in a data center or whether it should be viewed as a stable end state. Sometimes the answer will be clear (e.g., aggregation of messaging servers as described above). Often, however, the answer will not be clear. In close cases, the State should rely upon the combined good judgment of departments and data centers in negotiating individual transactions. If a data center and department agree upon co-location for a particular technology, that agreement should ordinarily be respected absent substantial contra-indications.

Because the decision of whether to co-locate information technology in a data center is so intertwined with basic considerations of quality, cost, and risk management from an enterprise-wide perspective, it is appropriate that the Department of Finance play a leading role in evaluating the merits of any co-location proposal pursuant to the general policy direction set forth above.

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I. General Principles of Management Responsibility

A. Existing Allocation of Responsibility for the State's IT Infrastructure and Resources

The State's information technology resources include the following elements, among others:

- People (i.e., the State's professional IT workforce);
- Technology
    - Computing Hardware
    - Telecommunications Networks
    - Software
    - Data
    - Facilities
- Organization
    - Standards
    - Policies
    - Processes

One of the most important IT governance questions facing the State is how to allocate management responsibilities over these resources. The State CIO's "A Proposal for the Future Governance of California's Information Technology Programs and Resources (February 11, 2003) ("hereinafter "the IT Governance Proposal") focused primarily on strategic planning, leadership, control functions and the relationship between strategic planning, control and implementation. In adopting this organizational focus, the IT Governance Proposal assigned primary responsibilities for significant aspects of the State's IT standards, policies and processes. However, the proposal did not directly address the question of management responsibility over the State's technology infrastructure (i.e., our computing hardware and supporting facilities).

Many of the resources listed above are dispersed in departments throughout government; certain resources, however, have been concentrated in several State data centers that serve one or more client departments. The two data centers which serve the largest number of State and local clients with diverse computing needs are the Stephen P. Teale Data Center ("TDC") and the Health & Human Services Data Center ("HHSDC").

As a general matter, we have concentrated responsibility over large mainframe systems and their associated resources in TDC and HHSDC, and we have dispersed responsibility over servers and desktop functions to individual departments. This allocation of responsibility was not the result of any deliberate, statewide strategy. Instead, this allocation appears to have happened almost by default as departments during the 1990's expanded their own IT resources through the purchase of personal computers, local networks, servers and server-based applications (which mirrored a trend in the industry towards increasingly sophisticated computing applications at lower cost using local networks and server-based platforms). HHSDC has also developed a substantial expertise in managing complex system integration projects in close cooperation with the Department of Social Services, the counties, and the HHS Agency.

There has been very little coordination among departments and between the data centers in how these resources have been developed and managed. As a result, we have established, mostly by accident and inattention, information technology "silos" along departmental and data center lines that have largely defeated any sustained attempt to achieve enterprise-wide benefits in information technology for the State.

Strategies for avoiding the creation of IT silos and for creating enterprise-wide economies of scale have been discussed for years in California and around the country. The issue most commonly arises in discussions about consolidating our computing resources in data centers and consolidating our data centers. It is natural for the issue to arise in this context because consolidation of responsibility makes it easier for enterprise-wide thinking and action. For example, the legislation creating the now-defunct Department of Information Technology (SB 1) directed the department to address the question of whether to "consolidate existing data centers." In response, DOIT produced the "Data Center Consolidation Study" (1997) which set forth a number of options. More recently, the IT Governance Proposal identified "the extent to which computing resources should be aggregated in data centers and the proper use of data centers" as issues to be considered for a statewide IT strategic plan.

The Legislative Analyst also weighed in this year with a recommendation that TDC and HHSDC be "administratively consolidated." The Department of Finance has committed to the LAO and the Legislature that the Administration would address this recommendation in hearings held

in connection with the May revise. The State CIO has participated in several meetings this Spring to discuss the LAO's proposal with staff from the LAO, Finance, the data centers and the two agencies in which TDC and HHSDC reside (i.e., respectively, the Business Transportation & Housing Agency and the Health and Human Services Agency). Finance staff has asked the State CIO to provide a strategic perspective on the question of data center consolidation to help inform their analysis.

As we have discussed the LAO's proposal, it has become clear that data center consolidation is just one piece of a broader puzzle. In addition to data center consolidation, we also have before us questions about (1) whether the location of and responsibility for servers should be moved from departments to data centers (a move referred to herein as "server aggregation"), (2) whether responsibility for certain server-based, enterprise-wide applications should be lodged in the data centers (e.g., messaging servers and e-mail applications), and (3) whether departments should be able to "co-locate" IT equipment at the data centers (i.e., physically locating certain IT infrastructure owned by a department within a data center facility to achieve certain economies of scale while maintaining primary management responsibility for that equipment with the department).

Each of these issues is but a specific variant of the broader question identified above: How to allocate responsibilities over the State's IT resources and infrastructure?

B. Governance Principles Affecting Allocation of Management Responsibility

As stated in the IT Governance Proposal, the mission for information technology in State government is as follows:

> The State will manage, deploy, and develop its information technology resources to support responsive and cost-effective State operations and to establish timely and convenient delivery of State services, benefits, and information.

Particularly during the current budget crisis, our primary focus must be on considerations of **quality** (i.e., responsiveness, timeliness and convenience), **cost** (i.e., best value) and **risk management** (including cyber-

security). Moreover, our focus must be on the overall State **enterprise**, not just the interests of individual departments.

In addition to these factors, the IT Governance Proposal set forth 11 fundamental principles of IT governance. From that list of 11, the following four are the most relevant principles to the present discussion:

- Cost-effective information technology must be driven by an organization's business needs, and not by the technology itself, and should be procured using processes that ensure receipt of best value.

- Technology strategic planning must be aligned with business strategies and have relevance for both current and anticipated needs.

- Governance roles should be assigned based upon departmental core competencies.

- There must be clearly assigned roles and responsibilities to ensure accountability.

These governance principles reflect our conclusion that quality, cost and risk management are likely to be maximized when management responsibility for IT resources and services is clearly and closely aligned with departmental core competencies and business needs. Accordingly, allocating responsibility for IT resources among departments depends upon the nature of departmental competencies and upon the nature of the computing resources and services at issue.

For purposes of analysis, it is useful to divide departments into three categories:

- **Full-Service Data Centers** which have core competencies in procuring, housing, managing and securing a wide variety of information technology systems on behalf of a number of customer departments.

- **Full-Service Program Departments** which have significant IT infrastructure and competencies to support their own program responsibilities but generally do not have the full complement of

data center infrastructure necessary to support multiple customers. The Franchise Tax Board is a good example of a full-service program department.

- **Program Focused Departments** which have core competencies in program areas and only limited competencies for managing IT resources. These departments often have responsibility for some local-area-network infrastructure, desktop systems and servers.

The State's computing resources and services may also be split into three categories (again, for purposes of analysis only since these categories tend to bleed into one another):

- **Single-Department Computing,** which refers to those very specialized computing technologies and services required by only one department (e.g., Caltrans has very specialized systems for traffic control and management).

- **Multiple-Department Computing,** which refers to computing technologies and services required by small groups of departments but not generally required by all departments (e.g., departments involved in revenue collection have common information needs, as do departments involved in law enforcement activities).

- **Enterprise-wide Computing,** which refers to computing technologies and services required by all or nearly all State departments (e.g., e-mail services and web services).

As a general matter, computing technologies that are unique or proprietary to an individual department's business needs (i.e., single-department computing) should be operationally managed by that department (assuming it has the capacity to manage the technology and there are not countervailing special considerations that would warrant management by a general purpose data center). Similarly, computing services that are widely used throughout government and which may be physically consolidated (i.e., enterprise-wide computing) should generally not be managed by individual departments (even Full Service Program Departments), but should be centrally managed by a data center in order to secure consistent quality, economies of scale, appropriate risk management and security.

Finally, it is important that we distinguish between operational responsibility for computing systems and the physical location and control over those resources. Many computing resources may be remotely located from their end-users (e.g., mainframes and servers). The physical location of those resources is one factor in determining operational responsibility, but it is not an overriding factor. Operational responsibility for computing services should depend more upon core competencies than physical location, while physical location should depend more upon technical capability, network reliability, economies of scale through physical consolidation, and security considerations.

In light of all of the above, the State should allocate responsibility for information technology resources and infrastructure to maximize the likelihood that, from an enterprise-wide perspective, the management of those resources and infrastructure will result in the State (1) receiving the best value for their purchase, maintenance, and operation, (2) realizing the most consistently appropriate levels of quality, security and risk management, and (3) ensuring that departmental core competencies are reinforced and respected.

II. Consolidation of TDC and HHSDC

The Legislative Analyst's Office has recommended that TDC and HHSDC be merged administratively (e.g., merging their executive, administrative, accounting and HR functions) but continue to operate in two separate facilities with most computer functions initially unaffected. Finance staff has worked for the last several months with the data centers and representatives from the Health and Human Services Agency and the Business Transportation and Housing Agency to explore possible savings that might be achieved through administrative consolidation and to identify obstacles and risks. The analysis by the Department of Finance indicates that there would not be any immediate operational savings, that full administrative consolidation is not clearly feasible without making significant modifications to computer operations, that the most significant long-term savings probably would not result without significant up-front investments to achieve operational consolidation, and that one of the risks of administrative consolidation relates to the stability of HHSDC's Systems Integration Division which is responsible for administering several large welfare computer projects that are of strategic importance to the State. In light of these pros and cons, which in the short-term are equivocal at best, Finance staff sought the State CIO's advice on data center consolidation from a strategic perspective.

For the reasons discussed below, I conclude that the State should take a first step towards full operational consolidation by establishing a Statewide Consolidated Data Center ("SCDC") with separate HHS and Teale divisions within that data center. SCDC should be given power to make purchases of information technology on behalf of other departments (either by special statutory provision or by a joint powers agreement with DGS). SCDC would examine during the first year of its operations the extent to which its two divisions can be further consolidated over the next three to five years. A number of issues remain to be resolved before a final proposal for executive consolidation can occur (including the question of where SCDC should be located within the State's bureaucracy). To identify and resolve these issues, the State CIO will appoint a team of high level IT executives within the State to prepare a Statewide Consolidated Data Center Reorganization Proposal pursuant to which a consolidation would occur as of July 1, 2004.

A. Maintaining the Status Quo

The State is essentially presented with the following three options with respect to TDC and HHSDC: (1) Maintain the status quo, leaving the State with two completely separate, general purpose data centers and relying upon the data centers to achieve some greater efficiencies through cooperative arrangements; (2) Immediately pursue full administrative and operational consolidation; and (3) Approach consolidation in stages, with executive management consolidation of the data centers under one agency being the first step.

The status quo is unacceptable for a number of reasons. First, although we have no guarantee of ultimate cost savings from consolidation, the potential is quite real, and the possible savings are quite substantial. This conclusion is based upon DOIT's 1997 consolidation study, which found that the large up-front costs of consolidation would eventually be outweighed by accumulated annual savings, and upon the general experience in the industry. According to the META Group, which Finance consulted in performing their analysis of the LAO's recommendation, 60-70% of data center consolidations achieve ongoing annual expenditure reductions of 20-30% following a one-time investment equal to 20% of overall budget. Admittedly, these sort of generalized statistics can be misleading because they lump together many different types of consolidations, some of which are much easier to accomplish than other types of consolidations (e.g., an "easy" consolidation involves physically consolidating two data centers located in separate facilities where the data centers use basically the same technologies). The most we can say right now is that even though there may be significant savings, achieving those savings will require careful, comprehensive planning and a significant up-front investment. Moreover, the savings are not guaranteed, and consolidation carries with it a modicum of risk. However, maintaining the status quo would in effect mean that the State would entirely turn its back on the potential for significant savings and efficiencies.

Second, the existence of two general-purpose data centers creates conflicting voices about basic infrastructure issues in the State's technology program. These conflicts make it difficult to determine whether the State is achieving the most appropriate levels of quality, security and risk management, and whether departmental core competencies are being reinforced and respected. So long as HHSDC and TDC remain separate and

in partial competition, there will always be a significant risk that their individual organizational interests and their competitive posture will undermine enterprise-wide objectives. As a consolidated entity, SCDC could make decisions about quality, security, and risk management from an enterprise-wide perspective without worrying about competitive pressures from another State data center. Moreover, the Department of Finance and SCDC could then jointly make decisions about whether particular technologies should be developed in a data center or in a department without concern for competitive positioning.

B. Full Administrative or Operational Consolidation

Immediately pursuing full administrative or operational consolidation is equally unacceptable for reasons already examined by the Department of Finance. All parties agree at present that we do not have sufficient information to know how to proceed with full operational consolidation, how much such a consolidation would cost and what the savings might be. Because the two data centers have developed such different IT infrastructures, we can agree that operational consolidation will be a complex, challenging and time-consuming process. But until a comprehensive, focused study is performed on the subject, we should not commit ourselves irrevocably to operational consolidation. Although LAO's suggestion of an administrative consolidation attempts to avoid the technological complexities of an operational consolidation, Finance has concluded at this point that the data centers' administrative systems are so tightly linked to their underlying technologies, that an administrative consolidation is not feasible without beginning to address operational issues. This linkage significantly raises the costs and risks of an administrative consolidation.

C. Executive Consolidation

The third option is an executive management consolidation, in which TDC and HHSDC are placed under single leadership and management but continue to operate, for the time being, as separate divisions within a Statewide Consolidated Data Center ("SCDC"). This should be viewed as a modest, and if necessary reversible, step in the direction of full consolidation.

Creating a Statewide Consolidated Data Center has significant benefits in addition to the possibility of achieving cost-savings if an administrative or operational consolidation ultimately occurs. First, one of the notable omissions of the IT Governance Proposal is the absence of a strong technology voice in the proposed IT leadership for the State. The primary leadership identified in the IT Governance Proposal – those who are represented on the proposed IT board – includes the CIO (responsible for strategic planning and leadership) and the two major control agencies (Finance and DGS). The CIO in the proposal is not necessarily a technologist. Indeed, the CIO's primary strengths must be in leadership, collaboration, organizational change and understanding how business needs may be supported by information technology.

California needs a Chief Technology Officer who will have the technical expertise to advise the CIO on the State's technical capacity, trends in information technology and the technical architecture for the State's IT systems. At present, there are several voices on these issues within the State, including the directors of the major data centers. The State would benefit by having a lead technologist who, based upon advice from other experts in the State and in industry, could provide the State with coherent, consistent advice on technical issues. If HHSDC and TDC were organized as separate divisions within a newly-established consolidated data center, the Director of the SCDC could function as the State's Chief Technology Officer. It would be appropriate to add the Director of SCDC to the proposed IT board.

Second, one of the most significant advantages from data center consolidation is the ability to achieve economies of scale in the data center's procurement, maintenance, and operation. As noted above, Finance staff has concluded that many of the economies of scale associated with operational consolidation would be extremely expensive to achieve because of the technological differences between HHSDC and TDC. Whether these economies of scale could ever be achieved depends upon a much more thorough evaluation than we have had time to conduct in the last several months. If the data centers were consolidated, an examination of this issue would be one of the high priorities during the first year of consolidation. A study conducted by and under the direction of SCDC would help resolve these issues.

Third, a consolidated data center could certainly achieve some economies of scale in procurement activities. HHSDC and TDC are already

exploring whether they could engage in cooperative procurements without consolidation, and those conversations should continue. Consolidation would immediately resolve this issue in favor of joint procurement. In addition, SCDC should be given power to engage in technology procurements on behalf of other departments (either by special statutory provision, a delegation from DGS or a joint powers agreement with DGS). This would permit us to develop SCDC as a center of excellence in technology purchasing, giving the State a natural locus for making enterprise-wide procurements that appropriately leverage the State's buying power.

If we pursue the executive consolidation of TDC and HHSDC into a Statewide Consolidated Data Center, we will need to resolve the question of SCDC's organizational place within State government. Four alternatives present themselves for initial consideration.

First, SCDC could be a standalone data center, either at cabinet level or with a direct report to the Governor's office (probably to the State CIO). This approach gives SCDC an inappropriately high profile in State government. SCDC will primarily be a departmental service organization. It does not need to be part of the cabinet. Although it arguably could be a standalone data center with a direct report to the Governor's office (probably to the State CIO), this would give the State CIO too great an interest in the operational activities of SCDC, thereby undermining the CIO's leadership and strategic planning roles, which as set forth in the IT Governance Proposal, are of paramount concern.

Second, SCDC could be located in the State and Consumer Services Agency, which already houses the Department of General Services. The advantage to this choice is that SCDC will face many of the same service issues that DGS faces, and the State and Consumer Services Agency has great familiarity with these issues. A downside to this approach is that if disputes arise between SCDC and DGS, those disputes would often be resolved within the agency and might not rise to the appropriate level of prominence (i.e., to the State CIO or to the IT Board, where both SCDC and DGS would have seats).

Third, SCDC could be located in the Business, Transportation and Housing Agency, which currently houses the Teale Data Center. The obvious advantage here is that BT&H already has expertise in exercising

supervisory jurisdiction over a data center. BT&H also houses several other large departments with substantial technology needs and infrastructure, most notably Caltrans and CHP.

Fourth, SCDC could be located in the Health & Humans Services Agency, which currently houses the Health & Human Services Data Center. As with BT&H, an obvious advantage here is that HHS already has expertise in exercising supervisory jurisdiction over a data center. There are several factors that may gravitate in favor of HHS over BT&H at this time. The most significant factor is that HHSDC's Systems Integration Division is responsible for administering several of the State's most complex and important technology projects. Finance's analysis emphasizes the increased risks to those projects if any action is taken which undermines their stability and continuity. Moving those projects to BT&H or, alternatively, moving HHSDC to BT&H while leaving the projects behind in HHS, may create unacceptable risks of project disruption. However, a downside to placing SCDC in HHS is that the HHS agency has a primary subject-matter focus that is much narrower than SCDC's total client base. On the other hand, because of the nature of their programs, HHS has learned how to serve a wide variety of State and local clients, and has developed a robust customer-service orientation.

This issue, along with several other technical issues associated with an executive consolidation, warrant additional analysis and discussion. Having made the fundamental decision to recommend the consolidation of HHSDC and TDC into a Statewide Consolidated Data Center, the State CIO intends to appoint a small team of IT leaders in the State to prepare a formal reorganization plan that would result in an executive consolidation taking effect on July 1, 2004. Because of budget constraints, the plan will focus on what areas of consolidation can take place without requiring significant up-front investments (i.e., savings must come first).

III. Aggregation of Servers in Data Centers

A. Operational Responsibility for Servers

Server aggregation describes a process of consolidation where large numbers of servers that are presently owned, operated and located in departments are physically moved to a data center, and operational responsibility for those servers is transferred from the department to the data center. Ownership of such servers can either be transferred simultaneously to the data center or ownership can change when the equipment is refreshed by the data center in the ordinary course of business.

Server aggregation represents a complete consolidation of dispersed servers from departments to a data center (i.e., the servers are both physically and operationally consolidated in the data centers). This type of complete consolidation makes most sense only when the types of servers subject to aggregation are common to many departments. Servers that are used throughout the enterprise are most cost-effectively managed centrally. Central management of servers creates the best environment for establishing minimum standards of quality and security and ensuring that those standards are actually observed throughout the enterprise. Central management of commonly used servers creates the best opportunity for securing economies of scale in the procurement and operational management of these resources. To achieve the desired economies of scale, data centers and departments should work with the Department of Finance to determine the types of servers that are most appropriate for aggregation and how aggregation affects departmental and data center budgets and staffing.

B. Operational Responsibility for Enterprise-Wide Applications

Maintaining a server is a separate function from operating and maintaining the applications that run on a server. Responsibility for server maintenance can be lodged in a data center while responsibility for operating and maintaining the applications that run on the server can be lodged in a program department. This is, in fact, a fairly typical division of responsibility between a data center and a customer (e.g., the data center maintains the mainframes, but program departments maintain and operate the programs that run on the mainframes).

Over the last year, we have been discussing the question of whether the data centers could begin expanding the scope of their responsibilities to encompass operation and management of enterprise-wide applications that run on servers. Our initial focus has been upon the possibility of aggregating messaging servers in a data center and centrally managing e-mail applications. All departments have a need for cost-effective and secure e-mail. There are few, if any, departments that can credibly claim that their investment in electronic messaging infrastructure provides any meaningful differentiation for the department. Centralized management of electronic messaging services is very likely to result in substantial annual savings and vastly improved management of those services, creating both enterprise-wide standards for quality and substantial improvements in security. For example, HHSDC, which has been offering this service to its customers, currently charges a rate of approximately $13 per user per month for messaging services with a base of 12,000 users. A preliminary analysis indicates that rates may drop to approximately $11.28 with 15,000 users, $9.84 with 20,000 users, $6.55 with 50,000 users and $5.08 with 100,000 users. The economies of scale here are unmistakable. Centralized management does *not* mean the State needs to adopt a single messaging application. Even central management of a few of the most commonly used messaging applications would create a much better environment for proper management and operations.

In view of the initial work already done by HHSDC in aggregating messaging servers and applications, it appears that the State should be aggregating its messaging servers in a data center as quickly as possible. The State should immediately pursue aggregation of messaging servers and messaging applications into HHSDC to the maximum extent possible. As the data center gains experience with this effort, we should begin examining whether there are other enterprise-wide applications that would benefit from a similar form of centralized management.

C. Co-Location of Computing Resources

Co-location describes a voluntary data center service offering where a data center customer maintains ownership and primary operational responsibility for certain computing resources (e.g., a set of servers and associated software applications which run on those servers) but those resources are physically housed in a data center. This type of service takes advantage of a data center's physical infrastructure (e.g., floor space, air-

conditioning, power supply and backup, network support, and physical security) while recognizing that department-specific technologies may be most effectively managed by the department itself instead of by a data center.

Because co-location is a mixed form of consolidation – i.e., physical consolidation but not operational consolidation – it naturally raises the issue of whether it should be viewed in a particular case as only a transition position between fully decentralized and fully consolidated, or whether it should be viewed as a stable end state. There are quite a few factors that influence the decision of whether it is most cost-effective at a particular point in time for a department or a data center to have responsibility for specific technology infrastructures. As noted above in the discussion about data center consolidation, responsibility for technology depends upon the interaction and intersection between departmental expertise and the type and nature of the technology at issue. Particularly in light of the history in California over the last decade of decentralized development of server infrastructures and associated resources (including the trained workforce in departments that supports these infrastructures), the transition to a more centralized allocation of responsibility between departments and data centers is going to take a significant period of time and take a substantial degree of patience and cooperation. In other words, the factors that influence the decision of whether to co-locate or full consolidate may well change over time and vary from department to department. There is no single, simple rule to govern this choice.

This does not mean we are left entirely without guidance. Certain decisions can be made with confidence. For example, as noted above in the discussion of server aggregation, there are certain re-allocations of responsibility to data centers that have immediate and obvious strategic benefits for the State. It is also fair to say that Program Focused Departments which have limited IT competencies should generally avoid co-location in favor of fully managed services.

However, the choice between co-location and fully managed services is more difficult when looking at IT infrastructure managed by a Full Service Program Department, which may be fully capable of managing even very significant IT resources. In these cases, there should be a careful consideration of the precise type of technology that is subject to possible co-location. To the extent that the technology falls into the category of Single

Department Computing, co-location probably is the better approach since a data center is unlikely to achieve economies of scale by having operational responsibility for computing technologies that are used by only one department. By contrast, Multiple Department Computing or Enterprise-Wide Computing technologies are much more likely to benefit from centralized management by a data center.

In addition to these generalized considerations, there is significant value in building trust between departments and data centers by letting them negotiate between themselves their own balanced allocation of computing resources. The choice between co-location and fully managed services is not entirely a matter of economics. It is also influenced by the organizational relationships between departments and data centers. A positive experience through co-location can be a first step towards greater reliance upon data center management. By contrast, a negative experience with a data center – particularly if the affected department was mandated to use the data center over its objections – can result in very long-lasting feelings of mistrust. These sort of organizational obstacles can significantly increase resistance to any further change, no matter how compelling the economics.

In other words, if a department and data center both agree upon co-location, we should encourage those agreements at this point in time irrespective of whether that particular co-location is a transition state or a stable condition. Both the department and the data center will learn from co-location transactions, and this learning is likely to have an impact upon the extent to which it ultimately makes sense for a data center to assume full responsibility for that infrastructure and application. Moreover, co-location creates a potential for savings for certain departments and the data centers by taking advantage of excess physical capacity at the data centers while giving the department an opportunity to put the associated space to a better use for the department (realizing savings from not having to maintain a raised-floor, data center-like environment). Co-location thus supports the overall strategic goal of moving towards a better allocation of responsibility for the State's computing infrastructure and resources.

Because the decision of whether to co-locate information technology in a data center is so intertwined with basic considerations of quality, cost, and risk management from an enterprise-wide perspective, it is appropriate that the Department of Finance play a leading role in evaluating the merits of

any co-location proposal pursuant to the general policy direction set forth above.